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(पाँचवाँ पुनरीक्षण)

Indian Standard

CROP PROTECTION EQUIPMENT — HAND-OPERATED STIRRUP-TYPE SPRAYER — SPECIFICATION

(Fifth Revision)

ICS 65.060.40

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

August 1996

Price Group 4

Crop Protection Equipment Sectional Committee, FAD 25

FOREWORD

This Indian Standard (Fifth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Crop Protection Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

This standard was first published in 1961 as specification for single-barrel stirrup-pump for public health use. With a view to widening the scope of the standard to cover the requirements for agricultural use as well, the first revision was published in 1965. The second, third & fourth revisions of the standard were published in 1972, 1975 and 1982 respectively. A need was again felt to revise the standard in line with the revision of other sprayer standards. This revision incorporates, among other, the following:

a) Amendment No.1 issued to earlier version of the standard,
b) Editorial changes including updating of referred standards,
c) Test for piston made of synthetic rubber,
d) Materials of construction are modified and chemical composition of brass casting components as per relevant Indian Standard is to ensure conformity,
e) The requirement of hydraulic agitator is made optional for the sprayer meant for agricultural use, and
f) Order of testing.

The figures given in the standard are meant only for illustration of the components. These should not be considered as suggestive of any standard design.

For the guidance of purchaser, Annex A has been compiled. Besides, quoting the number of this standard, the details desired in the Annex may also be stated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
CROP PROTECTION EQUIPMENT — HAND-OPERATED STIRRUP-TYPE SPRAYER — SPECIFICATION
(Fifth Revision)

1 SCOPE

1.1 This standard specifies material, performance, constructional and other requirements of hand-operated stirrup type sprayer used for spraying pesticides.

1.1.1 The spraying with this type of sprayer is done with an average normal working pressure of 300 kPa and 75 kPa for agricultural and public health purposes respectively. (100 kPa = 1.019 7 kgf/cm^2 = 1 bar).

2 REFERENCES

The Indian Standards given in Annex B contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated.

3 TERMINOLOGY

For the purpose of this standard, the following definitions in addition to those given in IS 8480:1977 shall apply (*see also* Fig. 1 and 2).

3.1 Cycle

See **3.2** of IS 3906 : 1995.

3.2 Gasket

See **3.4** of IS 3906 : 1995.

3.3 Guide

A component for guiding the movement of the piston-rod.

3.4 Handle

A component on the piston rod.

3.5 Hose Connection

See **3.8** of IS 3906 : 1995.

3.6 Piston

See **3.12** of IS 3906 : 1995.

3.7 Piston Displacement

See **3.13** of IS 3906 : 1995.

3.8 Piston Rod

See **3.14** of IS 3906 : 1995.

3.9 Pump Cylinder

See **3.17** of IS 3906 : 1995.

3.10 Spreader

See **3.19** of IS 3906 : 1995.

3.11 Stirrup-Pump

A pump, with foot rest and stirrup, for producing spray.

3.12 Stroke

The maximum travel of the piston rod in one direction when the handle moves from its lowest possible position to its highest possible position.

3.13 Total Mass

The mass of complete sprayer with all its mountings but without any liquid and discharge line, that is, without delivery hose, cut-off device, lance and nozzle.

3.14 Travel Limiting Device

A device for limiting the stroke.

3.15 Valve Assembly

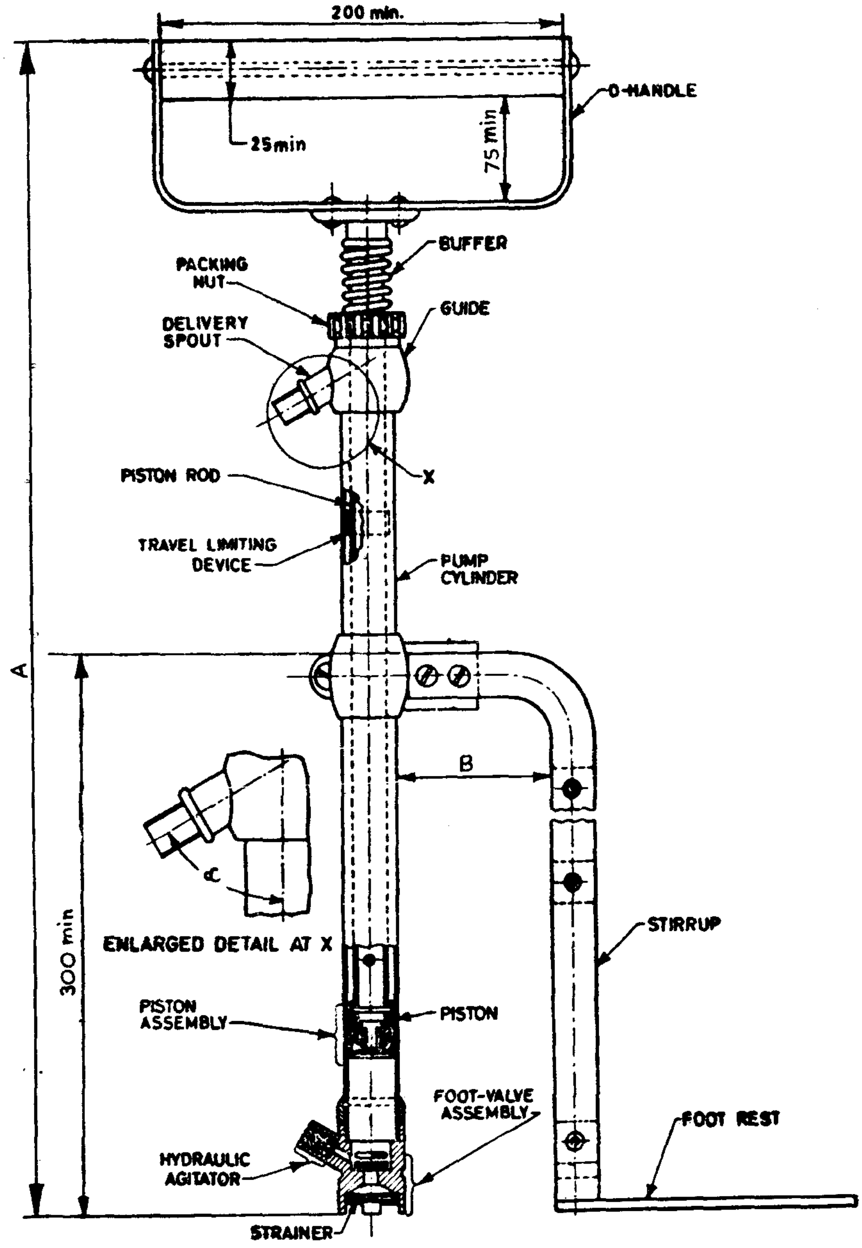
See **3.23** of IS 3906 : 1995.

3.16 Volumetric Efficiency

See **3.24** of IS 3906 : 1995.

4 MATERIAL

4.1 The material of construction of various components of the sprayer shall be selected from col 3 of Table 1. The material other than brass casting may conform to the relevant Indian Standards, however brass casting components shall conform to the chemical composition as specified in IS 292 : 1983 (Grade to be declared by the manufacturer). Some of the relevant Indian Standards are given in Annex B of



All dimensions in millimetres.

FIG. 1 TYPICAL DESIGN OF A HAND - OPERATED STIRRUP - PUMP TYPE SPRAYER

IS 3652 : 1995 for guidance.

4.2 The material for spray lance, nozzle, cut-off device and its components shall be as given in Table 1 of IS 3652 : 1995.

4.3 All metallic parts coming in contact with the pesticide should preferably be of the same material to minimize bimetallic corrosion.

4.4 The material for various parts shall be declared by the manufacturer in the manual (*see* 8.1).

5 CLASSIFICATION

5.1 The stirrup type sprayer shall be classified on the basis of the material of construction of pump cylinder and shall be of the following two classes:

a) *Brass Sprayer* — If the pump cylinder is made of brass, and

b) *Plastic Sprayer* — If the pump cylinder is made of plastic.

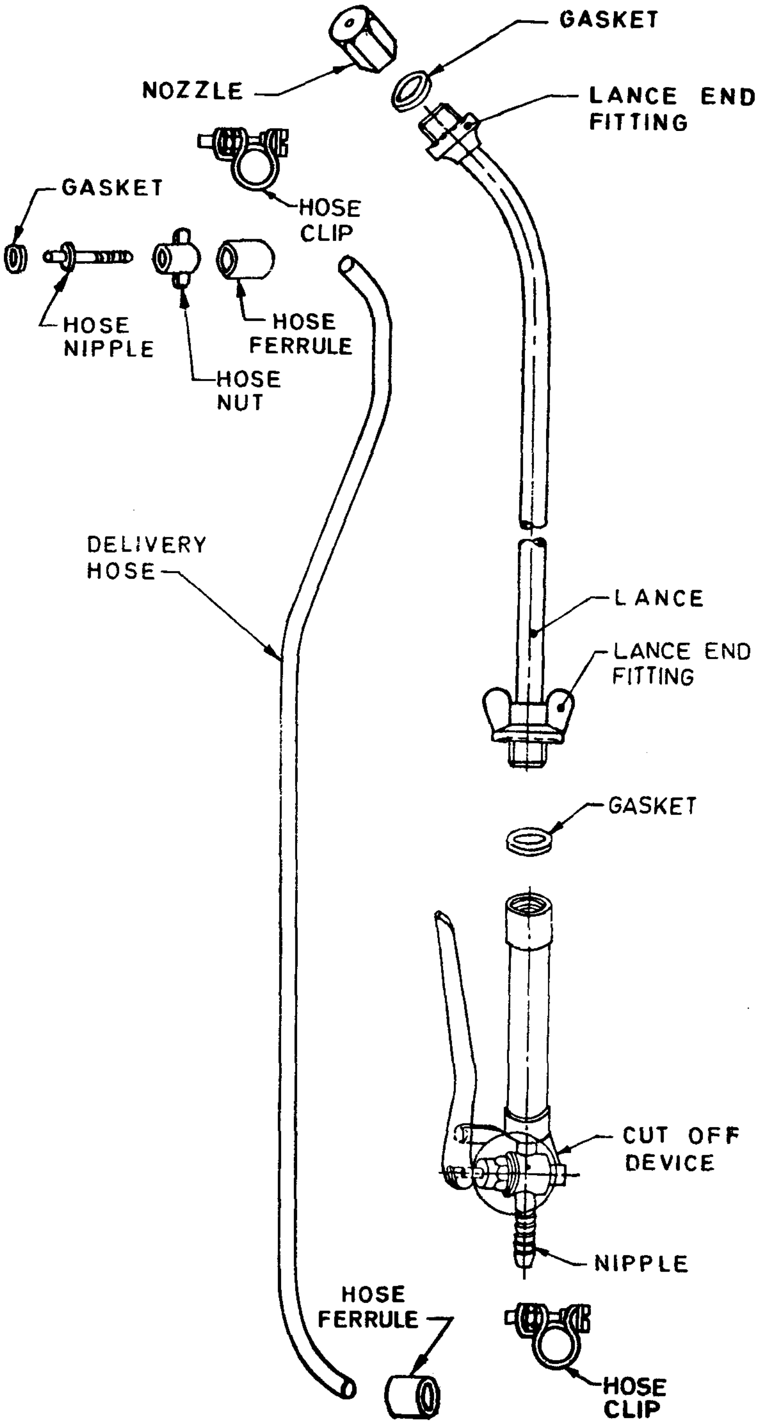


FIG. 2 DISCHARGE LINE OF SPRAYER

6 PERFORMANCE REQUIREMENTS

6.1 Discharge Rate

When tested in accordance with the method given in **6.1.1** of IS 10134 : 1994, the pump shall be capable of discharging a minimum of 400 ml and 550 ml of water per minute for agricultural and public health application respectively.

6.2 Volumetric Efficiency

When tested in accordance with the method given in **6.2** of IS 10134 : 1994, the volumetric efficiency shall be not less than 80 percent.

6.3 Endurance

The sprayer shall withstand the test prescribed in **8.1** of IS 10134 : 1994.

7 CONSTRUCTIONAL REQUIREMENTS

7.1 Height

The overall height of the assembled pump from the

Table 1 Materials for Construction of Various Components

(*Clause* 4.1)

Sl No.	Component	Material
(1)	(2)	(3)
i)	Pump cylinder	Brass, Engineering plastic
ii)	Pump cap	do
iii)	Packing nut	do
iv)	Guide	do
v)	Delivery spout	do
vi)	Valve seat	do
vii)	Piston rod	do
viii)	Hose nut	Brass, Engineering plastic
ix)	Hose nipple	Brass, Engineering plastic, Aluminium alloy
x)	Piston	Chrome tanned leather Synthetic rubber, PVC
xi)	Spreader	Brass, PVC
xii)	Handle	Mild steel, Wood, Engineering plastic
xiii)	Buffer	Brass, Spring steel
xiv)	Valve	Brass, Stainless steel
xv)	Travel limiting device	Brass, PVC
xvi)	Strainer	Brass, Plastic, Stainless steel
xvii)	Stirrup	Mild steel, PVC
xviii)	Foot rest	do
xix)	Cylinder clamp	Brass, Mild steel, PVC
xx)	Hose ferrule/clip	Brass, Mild steel
xxi)	Hose	Braided rubber, PVC (Plain or reinforced)
xxii)	Gasket	Synthetic rubber, PVC, Fibre Leather

NOTES

1 All the components mentioned above may not be present in a particular design.

2 The components other than those listed in the table and coming in direct contact with the pesticides shall be of corrosion resistance material.

bottom of the foot rest to the top of the handle, handle being at its lowest position, shall be in range of 600 to 800 mm (*see A* in Fig. 1).

7.2 Total Mass

The total mass (*see* **3.13**) shall be not more than 5.0 kg.

7.3 Pump Cylinder

The inner diameter of the pump cylinder shall be not more than 30 mm.

7.3.1 The pump cylinder shall withstand the test prescribed in **7.1** of IS 10134 : 1994.

7.4 Piston

The height of the straight portion of the piston shall be 13 mm minimum. In case the piston is made out of synthetic rubber, it shall withstand the test prescribed in **7.4** of IS 10134 : 1994.

7.4.1 *Spreader*

If provided, it shall be able to hold the piston in its position without distortion against the wall of the pump cylinder.

7.5 Piston Rod

The piston rod shall be not less than 9.0 mm in diameter.

7.5.1 *Buffer*

A buffer device shall be provided on piston rod in order to prevent the direct impact of handle on pump body.

7.5.2 *Travel Limiting Device*

A travel limiting device shall be provided on piston rod. The actual stroke length shall be declared by the manufacturer.

7.5.3 The piston rod shall withstand the test prescribed in 7.7 of IS 10134 : 1994.

7.6 Handle

The handle shall be of 'D' or 'T' shape. If of 'D' shape (*see* Fig.1), it shall have an inside grip not less than 200 mm long with inside vertical clearance of not less than 75 mm. The grip shall be attached with handle support. If of 'T' shape, the length of either side from the centre of the piston rod shall be not less than 100 mm. The diameter of the handle of both the types shall be not less than 25 mm.

7.7 Guide and Gland Packing

A guide at the top of the pump cylinder shall be provided. The gland packing shall be enclosed with guide.

7.8 Foot Valve

A detachable foot valve consisting of suction valve and strainer shall be attached at the lower end of the pump cylinder.

7.8.1 *Strainer*

The strainer shall be of removable type. Any side or diameter of the apertures of the strainer shall be not more than 625 µm.

NOTE — For measuring the size of apertures, select 10 consecutive apertures in the strainer and measure each side or diameter as the case may be. Average the measured value and report.

7.8.2 *Hydraulic Agitator*

A hydraulic agitator-cum-relief valve shall be provided either equipped in the footvalve assembly or attached separately in case the sprayer is meant for public health purpose. Its orifice shall point downward and shall be adjustable. It may be provided with the sprayer for agricultural use.

7.9 Stirrup and Foot Rest

The stirrup shall be fitted with pump cylinder through a clamp. The pump cylinder and stirrup shall be in proper alignment to obtain the necessary balance while using the pump.

7.9.1 A foot rest shall be attached at right angle to the stirrup. In case of foot rest of eliptical shape, the major and minor axis shall be minimum of 200 mm and 150 mm respectively when measured across outside to outside.

7.9.2 The stirrup shall have a minimum length of 300 mm when measured from bottom of foot rest to top most portion of stirrup. A clearance of minimum 80 mm (*see B* in Fig. 1) shall be maintained between the pump cylinder and the stirrup throughout their length. Provision shall be made to adjust the cylinder vertically with respect to the stirrup.

7.10 Threaded Connections

All threaded connections on the sprayer and its components shall conform to IS 2643(Part 1):1975. The size designation and type of threads are as given in Table 2. The engaged length of the threads shall be not less than 6 mm.

NOTE — The measurement of the thread size shall be done by gauges and not by measuring absolute dimensions (*see* IS 10216 : 1988).

Table 2 Threaded Connections

Component	Type	Size Designation
(1)	(2)	(3)
Delivery spout	External	G1/4B
Hose connection		
— for delivery spout	Internal	G1/4
— for cut off device	Internal	G1/4
Cut off device		
— inlet end	External	G1/4B
— outlet end	Internal	G1/2 or G1/4
Spray lance		
— Nozzle end	External	G1/4B
— Cut off device end	External	G1/2B or G1/4 B
— Bent portion for connection with straight portion (in case of type B2)	Internal	G1/4
Nozzle body	Internal	G1/4

7.11 Delivery Spout

A delivery spout having either straight or angular opening shall be provided. In case of angular opening, the angle between the axis of the opening and the piston rod (*see* α in Fig. 1) shall be minimum 45°.

7.11.1 The spout shall be nipple type or threaded type. The length of the nipple shall be not less than 20 mm.

7.12 Gaskets

The gaskets of synthetic rubber wherever provided, shall withstand the test prescribed in **7.4** of IS 10134 : 1994.

7.13 Discharge Line

7.13.1 *Delivery Hose*

A delivery hose of suitable diameter and preferably 5 metres in length shall be provided as agreed to between the purchaser and the supplier. The hose shall be connected with the delivery spout and the cut-off-device through hose connection.

7.13.2 *Hose Connection*

The hose connection for threaded and nipple type connections shall be of nut-nipple and clamp type, and clamp type respectively. The clamp shall be in the form of ferrule or clip.

7.13.2.1 The hose and hose connection shall withstand the test prescribed in **7.2** of IS 10134 : 1994.

7.13.3 *Cut-Off Device and Lance*

A cut-off device and lance shall be provided. These shall conform to the requirements of Annex C and D of IS 3652 : 1995 respectively.

NOTE — In case the cut-off device and spray lance of types other than those specified in Annex C and Annex D of IS 3652 : 1995 is required by the purchaser, for the special purpose, its requirements shall be as agreed to between the purchaser and the supplier.

7.13.4 *Nozzle*

Unless otherwise specified by the purchaser, the nozzle shall conform to the requirements of Annex F of IS 3652 : 1995.

8 OTHER REQUIREMENTS

8.1 Manual

The manual shall include technical specifications of the sprayer, material of construction of various component shown in the exploded view of the sprayer, instructions for operations and maintenance, common faults and their remedies and safety precautions. Reference of IS 11429 : 1985 shall also be given for the purpose of calibration of the sprayer.

8.2 Spare Parts

Spare parts, separately packed for each sprayer, according to the number required by the purchaser shall be provided. If no demand for spare parts has been made, a set of gaskets shall be provided with each sprayer.

8.3 Optional Items

At the option of the purchaser, the following item with the requirement indicated against that shall be provided in the sprayer. Any other optional items required by the purchaser shall be supplied, the requirement for the same shall be as agreed to between the purchaser and the supplier.

8.3.1 *Rubber Sheath*

The cylinder may be protected with a rubber sheath of minimum 3 mm thickness.

9 WORKMANSHIP AND FINISH

9.1 The components of the sprayer shall have a smooth finish and shall be free from pits, burrs, sharp edges and other visual defects that may be detrimental for their use.

9.2 The exposed mild steel parts shall have a protective coating to prevent surface deterioration. The steel used for hose ferrule/clip and buffer shall be plated with cadmium, zinc or nickel. Exposed brass parts may be given a suitable protective finish with clear transparent lacquer.

10 MARKING AND PACKAGING

10.1 Marking

Each sprayer shall be marked with the following particulars:

a) Manufacturer's name or registered trade-mark, and
b) Batch or serial number.

10.2 BIS Certification Marking

Each sprayer may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is goverened by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10.3 Packing

The sprayer shall be packed, as agreed to between the purchaser and the supplier, for safe handling in transit.

11 SAMPLING FOR LOT ACCEPTANCE

11.1 Unless otherwise agreed to between the purchaser and the supplier, sampling of the sprayers for lot acceptance shall be done in accordance with **3** of IS 7201(Part 1) : 1987.

12 METHODS OF TESTS

12.1 The requirements of this specification shall be tested in accordance with the relevant clauses of IS 10134 : 1994.

12.2 Tests for various requirements given in the order below shall be followed by the testing authorities:

a) Dimensional and visual check (*see* **7.1**, **7.6**, **7.7**, **7.8**, **7.8.1**, **7.8.2**, **7.9**, **7.9.1**, **7.9.2**, **7.11**, **7.11.1**, **7.13.1**, **7.13.2**, **7.13.3**, **7.13.4**, **8** and **10**);
b) Mass (*see* **7.2**);
c) Discharge rate (*see* **6.1**);
d) Volumetric efficiency (*see* **6.2**);
e) Endurance test (*see* **6.3**);
f) Dimensional and visual check (*see* **7.3**, **7.4**, **7.4.1**, **7.5**, **7.5.1**, **7.5.2** and **9**);
g) Pump cylinder test (*see* **7.3.1**);
h) Hose and hose connection test (*see* **7.13.2.1**);
j) Piston rod (*see* **7.5.3**);
k) Test for nozzle (*see* **7.13.4**);
m) Test for lance (*see* **7.13.3**);
n) Test for cut-off device (*see* **7.13.3**); and
p) Test for piston & gasket (*see* **7.4** and **7.12**).

NOTES

1 Test for hose and hose connection, lance and cut-off device strength test may be conducted at one time.

2 The piston and gasket test shall be conducted with a new set of pistons and gaskets provided with the sprayer.

ANNEX A

(Foreword)

SPECIFICATION SHEET

A-1 NAME OF THE PURCHASER

A-2 CLASS OF SPRAYER (*see* 5.1)

A-3 PREFERENCE OF MATERIAL FOR COMPONENTS (*see* 4.1 and Table 1)

A-4 TYPE OF APPLICATION (AGRICULTURAL OR PUBLIC HEALTH)

A-5 TYPE OF CUT-OFF DEVICE (*see* 7.13.3)

A-6 TYPE OF LANCE (*see* 7.13.3)

A-7 TYPE OF NOZZLE (*see* 7.13.4)

A-8 LENGTH OF DELIVERY HOSE (*see* 7.13.1)

A-9 TYPE OF HANDLE (*see* 7.6)

A-10 SPARE PARTS NEEDED (*see* 8.2)

A-11 OPTIONAL ITEMS (*see* 8.3)

ANNEX B

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
292 : 1983	Leaded brass ingots and castings (*second revision*)
2643 (Part 1) : 1975	Dimensions for pipe threads for fastening purposes: Part 1 Basic profile and dimensions (*first revision*)
3652 : 1995	Crop protection equipment — Foot sprayer — Specification (*fourth revision*)
3906 : 1995	Hand-operated knapsack sprayer (*fourth revision*)
7201 (Part 1) : 1987	Methods of sampling for agricultural machinery and equipment : Part 1 Hand tools and hand-operated animal-drawn equipment (*first revision*)
8480 : 1977	Glossary of terms related to crop protection equipments
10134 : 1994	Methods of tests for manually operated sprayers (*first revision*)
10216 : 1988	Pipe threads where pressure-tight joints are not made on the threads —Verification by means of limit gauges (*first revision*)
11429 : 1985	Methods for calibration of sprayers

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